Unemployment Insurance and Personal Bankruptcy

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Personal bankruptcy allows households to stop or delay the repayment of debts. In so doing, bankruptcy provides a form of insurance to households. In particular, bankruptcy allows households some flexibility in timing repayments in a way that allows for sudden unforeseen contingencies. As an implicit form of insurance, bankruptcy may augment, substitute for, or even limit other forms of insurance. Conversely, the presence of other forms of insurance against life's vicissitudes may enhance or limit the usefulness of bankruptcy. In this article, I investigate the interaction between one of the largest social insurance schemes, the U.S. unemployment insurance system (UI), and the personal bankruptcy system.

An overwhelmingly large proportion of those filing for bankruptcy (over two-thirds) have recently experienced a job disruption (Sullivan et al. [2000] and Domowitz and Sartain [1999]). Further, Cochrane (1991) finds that prolonged spells of unemployment are poorly insured and therefore result in large drops in consumption levels. How does the level of unemployment insurance available to workers affect the benefits of bankruptcy protection? Conversely, how do the benefits of bankruptcy alter the benefits generated by UI? Lastly, how does the presence of bankruptcy alter the consequences of scaling back unemployment insurance?

My findings are as follows: First, in the benchmark economy, introducing bankruptcy under even low UI replacement ratios lowers welfare. Second, reducing the UI replacement ratio increases bankruptcy rates.[1] Additionally,

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[1] One reason why this should not be seen as obvious is that penalties for bankruptcy involve ejection from credit markets. Therefore, lowering the replacement ratio hurts bankruptcy filers more than before, which may imply fewer, not greater, annual filings.

reducing the UI replacement ratio worsens consumption smoothing less when bankruptcy is allowed than when it is not. However, while welfare falls slightly with the replacement ratio, the fall is nearly independent of bankruptcy law. Third, bankruptcy lowers asset trade, which in turn implies a more equal long-run distribution of wealth (as fewer households hold either very low or very high asset levels to deal with income shocks). However, asset trading behavior is not affected greatly by changes in the UI replacement ratio. Fourth, UI is more important than bankruptcy: if society must choose either UI or bankruptcy, it should choose UI. Last, bankruptcy's role in providing insurance is clearly dependent on the existing social safety net. In summary, unemployment insurance appears to materially affect the desirability of bankruptcy protection, but allowing bankruptcy does not, in the benchmark economy, alter the consequences of scaling back UI.

The environment here is an extension of the environment studied in Athreya (2002b), augmented to include unemployment. Athreya (2002b) examines the welfare implications of recent "means-testing" proposals. The present work is perhaps closest to the work of Livshits et al. (2002) and Fisher (2002). The work of Fisher (2002) is the first empirical study of the effects of public insurance on the personal bankruptcy decision. With respect to bankruptcy, this work is also related to recent research of Chatterjee et al. (2001) and Li and Sarte (2002). With respect to positive analyses of unemployment insurance and its consequences, the work is related to, but simpler than, the models of Hansen and Imrohoroglu (1992) and Alvarez and Veracierto (2001). The two preceding articles study unemployment insurance in general and the effect of severance payments on job security, respectively.

The sudden fall in earnings associated with a layoff or firing or an inability to continue working due to illness has long been cited by bankruptcy scholars as an important correlate of bankruptcy.[2] Thus, it stands to reason that the treatment received by those who become separated from their employers will influence their decision whether or not to file for bankruptcy. I turn now to a simple dynamic general equilibrium model of consumption and savings in the presence of some uninsurable income risks, including the risk of losing one's job. To simplify matters, I abstract from production decisions as well as the impact of moral hazard in increasing the costs of administering an unemployment insurance system. In ongoing research (Athreya [2002a]), I pursue a more complete analysis to incorporate moral hazard and production.

1. THE MODEL

Bankruptcy allows a borrower to essentially design a state-contingent repayment plan, whereby repayment is made only when outcomes for the borrower

[2] Of course, this is no more causal than is having too little income or too much debt, given one's income stream.

are relatively good. In this sense, the amount of a household's income dedicated to loan repayment can be varied, allowing it to apply limited income in a difficult period towards consumption rather than debt service. Unemployment insurance and antipoverty programs, conversely, act directly on the income of the household and help it remain above a threshold. Both of these programs can help households insure themselves within a period against uncertain job or health prospects. However, both programs must be paid for.

Allowing bankruptcy implies paying more for loans, as households are also purchasing the right to suspend or completely avoid repayment, subject to penalties. The high rate on loans also means that as households attempt to avoid borrowing, each saves so much that the return to savings may fall relative to an economy without bankruptcy. In turn, this fall mutes the effectiveness of savings to carry consumption across periods. Unemployment insurance, for its part, must be paid for via (possibly distortionary) taxes. Furthermore, as is well known, UI may introduce inefficiency, as both the effort expended by currently employed households and the job search efforts of currently unemployed households may fall. Moreover, a major penalty for filing for bankruptcy is exclusion from credit markets. In contrast, while UI may directly lower the need for borrowing and subsequent bankruptcy, generous UI makes exclusion from credit markets less painful. Thus, while bankruptcy and UI act in different ways, the presence of each is likely to affect the other.

Preferences and Endowments

Individuals maximize the present value of expected lifetime utility, given by

$$E_0 \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\alpha} - 1}{1 - \alpha}, \tag{1}$$

where E_0 is the expectations operator, conditional on time 0 information, $\beta \in (0, 1)$ is the discount factor, c is consumption, and α is the measure of both risk aversion and the desire for intertemporal consumption smoothing. A full description of the household's optimization problem will be given after more notation is introduced.

Consumers in this market, intended to represent U.S. households, are assumed to be risk-averse price takers. They face uncertain labor incomes and other uninsurable idiosyncratic risks. The economy is composed of many long-lived households. At the beginning of each period, all households receive a random level of labor income that depends on their employment status. Households in the economy retain employment in each period with probability ρ and are subject to the risk of losing employment in a given period with probability $(1 - \rho)$. Once employment is lost, regaining employment occurs with probability ξ. An unemployed worker receives unemployment insurance in only the first period of unemployment, that is, when the worker is newly unemployed. In subsequent periods, there is a subsistence level of income given to households. The endowment structure for unemployed households is meant to reflect the current practice of the use of a flat "replacement ratio" and the limited length of UI benefits in the United States. Newly unemployed households receive $\theta\overline{Y}$, where $\overline{Y}$ is mean labor income and $\theta \in [\underline{\theta}, 1]$ the replacement ratio. After the first period of unemployment, households, if unemployed, will receive the subsistence transfer of $Y_{\min} > 0$.[3]

Given the exogenously imposed flow of households out of unemployment, the replacement ratio for UI benefits θ, and the long-run average employment rate μ_e, it is easily shown that the per-period lump-sum tax η_u necessary to finance the UI system is given by $(1 - \rho)\mu_e\theta\overline{Y}$.[4]

The endowments of employed households are random and cross-sectionally independent but are serially dependent. Agents are identical ex ante in terms of expected income, assets, and consumption. When employed, the after-tax endowment of a household in period t can take two values, $\widetilde{Y} = y_l$ and $\widetilde{Y} = y_h$, where the subscripts h and l denote high and low labor income, respectively, such that $y_l < y_h$.[5] Defining unemployment as a separate state for the endowment process is what allows for an analysis of how UI benefits interact with bankruptcy law.

There is a transition function over the income of employed households whereby $P(y' = y_l | y = y_l) = p_{ll}$ and $P(y' = y_h | y = y_h) = p_{hh}$. That is, p_{ll} is the probability that the labor income shock remains low in the next period, given that it is low in the current period. Similarly, p_{hh} is the probability that the labor income shock remains high in the next period, given that it is high in the current period. The assumption of serially dependent income introduces anticipation effects in asset holdings and default behavior and determines the effectiveness of using assets to smooth consumption. The parameters of the income process will be chosen to be broadly consistent with post-transfer income variability in U.S. data.

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[3] To focus on the interaction of bankruptcy and explicitly financed unemployment insurance, I avoid tracking the collection of taxes with which subsistence income payments are made. When analyzing changes in bankruptcy law, $Y_{\min}$ will remain fixed, so there is no harm in treating it as an endowment.

To keep matters simple, I did not specify UI replacement to depend on previous income. Doing so would entail tracking households flowing into employment separately, which increases the cost of computing solutions. Moreover, as job loss is exogenous with respect to income, the average household flowing into unemployment will have $\overline{Y}$ as the previous period's labor income.

[4] This is a simple example of a "bathtub" model of unemployment, whereby the exogenous flows into and out of employment are set such that there is a constant level of employed (and unemployed) households in the economy. See Ljungqvist and Sargent (2000). The flow into unemployment is given by $(1 - \rho)\mu_e$, and the cost of insurance payments to each household is $\theta\overline{Y}$. Therefore, per capita taxes, η_u, must satisfy $\eta_u = (1 - \rho)\mu_e\theta\overline{Y}$.

[5] I define endowments as "after-tax" income for simplicity of notation and exposition.

Assets

Agents may save using risk-free private bonds or risk-free government debt and may borrow on an unsecured credit market. Government debt is incorporated both for descriptive accuracy as well as to avoid artificially constraining households to the use of private borrowing and lending alone.[6] Household borrowing is subject to a liquidity constraint, and households may default on previously acquired debt. The stock of private risk-free debt is issued by diversified competitive financial intermediaries in order to finance loans to households. The market for privately issued unsecured credit in the United States is characterized by a large, competitive marketplace where price-taking lenders issue credit through the purchase of securities backed by repayments from borrowers. These transactions are intermediated principally by credit card issuers. As the typical credit card contract is described by a fixed interest rate and credit line, the interest rates charged by credit card issuers may be viewed as being set to cover the aggregate default rate rather than being individually tailored for each account. Further, interest rates do not appear to vary systematically with individual debt levels, even though the marginal likelihood of default may change.[7]

There will be two prices quoted for assets: a loan rate, r^l, for those who borrow and a deposit rate, r^d, for those who save. These two rates are different, because with the bankruptcy option, a certain fraction of households will default in equilibrium, and in order to break even, financial intermediaries will have to charge higher interest rates on loans than they pay for deposits. The stock of government debt is denoted D and is financed by a lump-sum tax $\eta_D = r^d D$ on all households, where r^d is the interest rate on risk-free savings deposits.

The assumption that all debt is unsecured is less restrictive than it may seem. The model best represents the section of U.S. households with little or no collateral and higher than average labor income risk that rely on unsecured debt to smooth consumption. Therefore, the welfare implications developed here apply directly to a population most affected by bankruptcy reform. Additionally, Gropp, Scholz, and White (1997) argue that in many cases those considering filing use unsecured credit to pay off secured debts and then discharge this debt in bankruptcy, thereby making the distinction between these types of debt less clear in practice.

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[6] The stock of government debt per capita will, however, be held fixed throughout all the policy experiments I conduct.

[7] On the existence of competitive equilibrium in a model where interest rates on loans cover average repayment rates, see Dubey et al. (2000).

Bankruptcy

Bankruptcy in the model will most closely resemble Chapter 7 "total liquidation" bankruptcy. If a household files for bankruptcy, its income and assets become known to the credit market, and if it qualifies, its unsecured debt is discharged but is then constrained for an uncertain period of time from borrowing. Households may, however, save during this time. The principal motivation for a random period of restricted credit access is that it reduces significantly the computational burden of solving the household's optimization problem. Specifically, the assumption allows one not to distinguish between households on the basis of the length of their credit market exile.[8] In each period following a bankruptcy, a borrowing-constrained household remains constrained with probability $(1-\psi)$. Therefore, the average time that a household is constrained from borrowing and prohibited from filing again is given by $1/(1-\psi)$.

The Cost of Bankruptcy and Deadweight Loss

Bankruptcy involves three types of costs. First, as was just discussed, it results in at least some exclusion from credit markets. Second, there are explicit time costs arising from court dates and other legal proceedings. Finally, societal disapproval or "stigma" may play a role (see Dubey et al. [2000]; Fay et al. [1996]; and Gross and Souleles [2000]).

An important drawback of using bankruptcy to provide insurance is that the penalties listed above typically do not involve a transfer of wealth from debtors to anyone, let alone creditors. I denote by λ all costs of bankruptcy beyond credit market exclusion. That is, λ represents the "deadweight" costs of bankruptcy. I will set λ to match observed bankruptcy filing rates among homeowners, given the current average length of credit market exclusion.

The Household's Problem

At any point in time, households belong to one of two mutually exclusive classes of credit market status and three mutually exclusive classes with respect to employment status. For credit status, households are either solvent or constrained from borrowing. Solvent households are those that have full access to credit markets and have the option of filing for bankruptcy. Borrowing-constrained households are those that have filed for bankruptcy in the past but have not yet been readmitted to credit markets.[9] With respect to employment

[8] For more on stochastic punishment spells in bankruptcy, see Athreya (2002b) and Chatterjee et al. (2001).

[9] Therefore, while the move from solvent to borrowing-constrained status is a choice for households, the release from borrowing-constrained status is exogenous.

status, households are either employed, newly unemployed, or unemployed for more than one period.

In each period, given their current income and beginning-of-period assets, households must choose consumption, c, and asset holdings to carry forward into the next period, denoted a'. From the individual's point of view, all saving is risk-free and earns the same rate of return. Therefore, the household makes no distinction between government debt and private bonds when choosing how to allocate its savings. Depending on whether it chooses to be a net borrower or lender, it faces either the net rate of interest on loans, r^l, or deposits, r^d, where $r^l > r^d$.

I restrict borrowing according to a household's credit status as follows. For solvent households, assets a' must be greater than $\underline{a}^S$, a negative number indicating that solvent households may borrow. Households that have filed for bankruptcy face a more severe restriction than solvent households in their ability to borrow. Their borrowing limit, denoted $\underline{a}^B$, therefore is given by $a' \geq \underline{a}^B$, where $\underline{a}^B > \underline{a}^S$. Similarly, households that are constrained from borrowing are also restricted in their borrowing, with a limit denoted $\underline{a}^{BC}$, whereby $a' \geq \underline{a}^{BC}$, where $\underline{a}^{BC} > \underline{a}^S$.

When a household is solvent, it must first choose whether or not to file. It then chooses assets subject to the constraints for solvent or borrowing-constrained households, depending on its employment status and default decision. The current period state vector, conditional on credit status, is denoted (e, a, y), indicating employment status, asset holdings, and current income, respectively.

Current labor income is denoted $y(e)$, where e denotes beginning-of-period labor market status. A worker's employment status belongs to one of three categories, that is, $e \in \{e_0, e_1, e_2\}$, where e_0 denotes an employed worker, e_1 a newly unemployed worker, and e_2 a worker who has been unemployed for more than one period. The law of motion for labor income is simple. In any period, an employed worker may lose his job with probability $(1 - \rho)$. He is then classified as "newly unemployed" and is eligible for UI benefits. In the following period, he finds employment with probability ξ, in which case he receives a (random) endowment of $y(e_0)$.[10] If he fails to find employment in this period, he is classified as "unemployed" and is therefore no longer eligible for UI benefits and receives labor income $Y_{\min} > 0$.

I denote the value of being solvent by V^S, the value of not filing for bankruptcy as W^S, the value of filing for bankruptcy as W^B, and the value of being borrowing-constrained as V^{BC}. The value of solvency is given as follows:

[10] This income is drawn from the conditional probability distribution of income, as if the household had received income shocks while unemployed. This simplifies the analysis by avoiding the use of a separate income process once released from unemployment.

$$V^S(e, a, y) = \max[W^S(e, a, y), W^B(e, a, y)], \tag{2}$$

where

$$W^S(e, a, y) = \max\{u(c) + \beta E V^S(e', a', y')\} \tag{3}$$

s.t.

$$c + \frac{a'}{1 + r^{d,l}} \leq y(e) + a \tag{4}$$

s.t.

$$a' \geq \underline{a}^S. \tag{5}$$

When the household chooses to file for bankruptcy, it has its debt removed, pays the nonpecuniary cost, λ, and then is automatically sent to the borrowing-constrained state, where it obtains value V^{BC}. Therefore, the value of filing for bankruptcy, W^B, satisfies

$$W^B(e, a, y) = \max\{u(c) - \lambda + \beta E V^{BC}(e', a', y')\} \tag{6}$$

s.t.

$$c + \frac{a'}{1 + r^d} \leq y(e) \tag{7}$$

s.t.

$$a' \geq \underline{a}^B. \tag{8}$$

To define V^{BC} above, note that households in the borrowing-constrained state face a lottery, whereby with probability ψ, they are returned to solvency (i.e., they are free to borrow and default in the following period), and with probability $(1 - \psi)$, they are still restricted from borrowing or defaulting. Thus, we have

$$V^{BC}(e, a, y) = \max\{u(c) + \psi\beta E V^S(e', a', y') + (1 - \psi)\beta E V^{BC}(e', a', y')\} \tag{9}$$

s.t.

$$c + \frac{a'}{1 + r^d} \leq y(e) + a \tag{10}$$

s.t.

$$a' \geq \underline{a}^{BC}. \tag{11}$$

I turn now to the definition of equilibrium in the model.

Equilibrium

The consumer choice problem above captures the decisions of a very large number of households. However, given the absence of perfect income insurance, households that have received many bad income shocks are likely to find themselves in debt, while those that have been lucky may have large levels of savings. Their choices are governed by a *decision rule*, which, for a household of type i, specifies asset holdings as a function of interest rates, employment status, income, current assets, and borrowing constraints.

An equilibrium consists of a decision rule for each type of agent and interest rates r^l and r^d such that four requirements are met. First, given these interest rates, decision rules solve the optimization problem described above for each type of household. Second, total economy-wide borrowing by households equals total economy-wide saving. Third, the spread between loan and deposit rates is such that financial intermediaries exactly cover their costs, given the observed bankruptcy rate. Fourth, the payments to newly unemployed households each period must be covered by tax revenues (i.e., the government runs a balanced budget while maintaining the stock of debt D). In addition, I restrict attention to steady state equilibria where the bankruptcy rate and the proportion of agents in the population with a given level of assets are stationary, that is, the same at every date.

Welfare Measurement

The welfare criterion used here measures the percentage change in consumption, in all states and at all dates, that would make a household indifferent between living in an economy in which a given policy experiment prevailed and one in which the benchmark setting prevailed. Let this increment/decrement to consumption be denoted by ϕ. A negative value for ϕ implies that households are worse off, and a positive value implies the reverse. Multiplying ϕ by mean household income then converts ϕ into a dollar measure of annual welfare gains or losses per household.[11]

[11] With the utility function used here, the welfare measure is given as follows. The desirability of outcomes will be evaluated according to the following expression:

$$\Lambda = \int_X V(x) d\mu, \tag{12}$$

where $V(x)$ is the maximal attainable utility from being in a given state x and μ is the long-run stationary distribution (C.D.F.) of households across states. Therefore, Λ is the expected value function of households over assets, income, *and credit status*. This is a utilitarian social welfare function that weights all households equally. It measures ex ante welfare. I use this measure to estimate the increment/decrement to consumption under a given bankruptcy policy, at all dates and states, that makes households indifferent between the economy defined by the proposed bankruptcy policy and the benchmark economy. I denote this increment/decrement ϕ. Let Λ^{bench} denote benchmark welfare, and Λ^{policy} denote welfare under a proposed policy. Given the preferences used here, ϕ will satisfy the following:

Beyond this measure of welfare, I will also examine the behavior of some other statistics in assessing the interaction between bankruptcy and UI. Given that changes in the replacement ratio alter the mean level of after-tax income for households in the model, it is useful to have a measure of consumption volatility that does not depend on average income, such as the *coefficient of variation* (denoted c.v.). The c.v. will also be useful when exploring the role of bankruptcy in altering the level of asset accumulation and decumulation.

To measure inequality, I use a traditional tool, the Gini Coefficient. Roughly speaking, this coefficient measures the departure of a given distribution of wealth, consumption, or income from a perfectly equal distribution. A Gini of one indicates, for example, that the very richest household holds the entirety of wealth, while a coefficient of zero indicates that all households hold exactly equal levels of wealth. A more disaggregated measure of inequality is the distribution of income, consumption, and wealth by various percentiles, which I also report below.

Parameterization

The model parameters are set to match observed bankruptcy rates under plausible levels of income shock persistence and volatility and are summarized in Table 1. For brevity, rather than including a full discussion here, I refer the interested reader to the details in Athreya (2002a, b).

With respect to unemployment insurance, I follow Hopenhayn and Nicolini (1997), who use the estimates of Meyer (1990). In particular, Meyer (1990) finds that the average length of insured unemployment is thirteen weeks, with a replacement rate of 66 percent and a 10 percent chance of reemployment at the end of the spell. I therefore set the model period at thirteen weeks, set $\theta = 0.66$, and set $\xi = 0.10$. The credit limit is set by noting that median unsecured debt among bankrupt households in recent years has fluctuated between one-fourth and one-half of annual median income (see Sullivan et al. [2000, 65–66, 122]). Credit card debt, to which the debt in the model corresponds most closely, was approximately \$9,500 in 1997, equal to U.S. median quarterly income (Sullivan et al. [2000]). Given the period of thirteen weeks, or one quarter, I therefore set $\underline{a}^s = \overline{Y}$. For simplicity, I set $\underline{a}^B$ and $\underline{a}^{BC}$ to zero.

An important parameter in the model with respect to bankruptcy is the one governing credit market exclusion, ψ. While ψ is not easily observable, lenders in the unsecured credit market still allow agents access to loan markets

$$\phi = \left(\frac{\Lambda^{policy} + \frac{1}{(1-\alpha)(1-\beta)}}{\Lambda^{bench} + \frac{1}{(1-\alpha)(1-\beta)}} \right)^{\frac{1}{1-\alpha}} - 1. \tag{13}$$

Under this criterion, $\phi > 0$ implies that households are better off under a proposed policy than in the benchmark case, and $\phi < 0$ implies the reverse.

Table 1 Parameters

Parameter	Value	Source
β (annual)	0.914	Calibrated
α	2.00	Aiyagari (1994)
p^i_{hh}	0.74	Heaton and Lucas (1997)
p^i_{ll}	0.74	Heaton and Lucas (1997)
ρ	0.006	Calibrated
μ_e	0.943	Alvarez and Veracierto (2001)
ξ	0.10	Meyer (1990)
θ (benchmark)	0.66	Meyer (1990)
y_h	1.25	Heaton and Lucas (1997)
y_l	0.75	Heaton and Lucas (1997)
$Y_{\min}$	0.40, 0.10	
λ	2.80	Calibrated
$\underline{a}^s$	$-\overline{Y}$	Huggett (1993); Sullivan et al. (2000)
$\underline{a}^B$, $\underline{a}^{BC}$	0	

following default or bankruptcy within a year or two. I set $\psi = 0.25$ such that the average period of exile from credit markets is four model periods, or one year.[12] The level of income received by unemployed households after unemployment benefits are exhausted, $Y_{\min}$, is set in the benchmark case to 0.40, to provide 40 percent of median household income, as a proxy for the various income support and transfer programs available to U.S. households. This level amounts to $1,332 per household per month.[13] Subsequently, $Y_{\min}$ will be set to a much lower 0.10, or $333 per household per month, to examine the role played by social insurance beyond unemployment compensation.

The parameter λ, which is the cost of bankruptcy in excess of credit market restrictions, will be inferred by the level that it must take in order to match observed bankruptcy filing rates. In terms of bankruptcy rates, total nonbusiness bankruptcy filings have been stable at roughly 1.3 million annually. Of these, roughly 70 percent are Chapter 7, "total liquidation" bankruptcies, implying an annual incidence of 0.9 percent.

2. RESULTS

To begin, I define the benchmark case, against which policy experiments will be compared.

[12] In this model, exclusion from borrowing hurts the households without helping anyone else. It is therefore a deadweight penalty and could have been left unmodeled by combining it with the general nonpecuniary penalty, λ.

[13] The transfers received by households beyond UI come from the major public assistance programs in the United States: Supplemental Security Income (SSI), General Assistance, Medicaid, and Temporary Assistance to Needy Families (TANF).

Table 2 Welfare Effects of Introducing Bankruptcy

θ	r^l	r^d	Bankruptcy Rate	Welfare Change ($)	Utility
0.66	4.39%	4.39%	—	—	−37.43
0.66	13.00%	2.57%	0.90%	−$66.88	−37.57
0.50	4.21%	4.21%	—	—	−37.49
0.50	13.00%	2.35%	0.99%	−$70.46	−37.63
0.40	4.06%	4.06%	—	—	−37.52
0.40	12.55%	2.31%	1.03%	−$62.70	−37.65

Definition 1 *Throughout the analysis, the "benchmark" economy is defined specifically to be the case where bankruptcy is allowed, the replacement ratio, θ, is set at* 0.66*, and $Y_{\min}$ = 0.40.*

I first study the consequences, when $Y_{\min} = 0.40$, of introducing bankruptcy into a setting where unemployment is already partially insured. The clear conclusion in this case is that bankruptcy protection is harmful, as seen in Table 2. Introducing bankruptcy is damaging even when the unemployment insurance system is very strict. The quarterly cost to the household of introducing bankruptcy ranges from $66.88, when $\theta = 0.66$, to $70.46, when $\theta = 0.50$, to $62.70, when $\theta = 0.40$. With respect to prices, I find that when bankruptcy is introduced, the interest rate on savings falls, while the rate on borrowing rises. For example, when $\theta = 0.66$, r^d falls from 4.39 percent to 2.57 percent, while r^l rises sharply from 4.39 percent to 13.00 percent. Such changes in interest rates are associated with worsened consumption smoothing, as the return to savings is low, while borrowing becomes very expensive. On the other hand, the option of bankruptcy allows households new consumption smoothing possibilities. On net, however, welfare appears to suffer. The welfare measure reported in Table 2 captures the change in welfare generated by the introduction of bankruptcy, holding the replacement ratio fixed. This result is summarized in Result 1.

Result 1 *In the benchmark economy, introducing bankruptcy under even low UI replacement ratios lowers welfare, increases interest rates on loans, and reduces interest rates on savings.*

Perhaps unsurprisingly, lower replacement ratios produce systematically lower utility levels. For example, when bankruptcy is not allowed, the expected utility of households falls from -37.43 to -37.49 to -37.52 as θ drops from 0.66 to 0.50 to 0.40 (see Table 2). The intuition here is simple. As the replacement ratio falls, the income risk faced by households rises, leaving more room for bankruptcy to be a useful form of implicit insurance.

Table 3 Effects of Lower UI Replacement Ratios

Panel A: Welfare Effects of Lower UI Replacement, without Bankruptcy

θ	r^l	r^d	Bankruptcy Rate	Welfare Change ($)	Welfare Change ($) Rel. to Benchmark
0.66	4.39%	4.39%	—	—	+$66.88
0.50	4.21%	4.21%	—	−$23.13	+$43.71
0.40	4.06%	4.06%	—	−$40.68	+$26.14

Panel B: Welfare Effects of Lower UI Replacement, with Bankruptcy

θ	r^l	r^d	Bankruptcy Rate	Welfare Change ($)
0.66	13.00%	2.57%	0.90%	—
0.50	13.00%	2.35%	0.99%	−$26.82
0.40	12.55%	2.31%	1.03%	−$36.60

Because bankruptcy causes less harm when the replacement ratio is low than when it is high, it appears that bankruptcy does play an insurance role. To see this, consider Panel A of Table 3 for the results when bankruptcy is not allowed. Welfare (relative to the case where $\theta = 0.66$, and bankruptcy is *not* allowed) falls slightly with the replacement ratio, by the equivalent of $23.13 when θ falls from 0.66 to 0.50, and by $40.68 when θ falls from 0.66 to 0.40.

As seen in Panel B of Table 3, when bankruptcy is allowed, the bankruptcy rate rises systematically when θ falls from 0.66 to 0.40, from 0.90 percent in the benchmark to 1.03 percent, an increase of 100,000 filings annually. This effect is supported in recent empirical work of Fisher (2002), who finds that higher UI benefits are associated with lower bankruptcy rates.

When welfare is measured relative to the benchmark economy, as shown in Table 4, the welfare effect of eliminating bankruptcy, while always positive, becomes smaller as θ rises. The gain from eliminating bankruptcy, relative to the benchmark, is $66.88 when $\theta = 0.66$ but drops to $26.14 when θ falls to 0.40. As noted earlier, all else equal, the effect of an increased interest rate on borrowing and a lowered rate on savings deposits would be to worsen consumption smoothing. Yet such interest rate changes are actually associated with small improvements in consumption smoothing, as seen in the column "c.v.-Cons." Panels A and B of Table 4 show that when $\theta = 0.66$, the c.v. of consumption falls slightly, from 0.1347 without bankruptcy to 0.1336 when bankruptcy is allowed. This suggests that bankruptcy must be providing some offsetting consumption benefits. Nonetheless, the costs of implementing a bankruptcy system, from both the socially wasteful penalty of credit market

Table 4 Distributional Effects of Lower UI Replacement Ratios

Panel A: Distributional Effects of UI, without Bankruptcy

θ	Gini-Cons.	c.v.-Cons.	c.v.-Assets	Gini-Assets	Avg. Borr. (% of $\overline{Y}$)
0.66	0.0663	0.1347	1.6878	0.9497	−17.21%
0.50	0.0667	0.1363	1.6809	0.9465	−17.17%
0.40	0.0671	0.1374	1.6829	0.9477	−17.12%

Panel B: Distributional Effects of UI, with Bankruptcy

θ	Gini-Cons.	c.v.-Cons.	c.v.-Assets	Gini-Assets	Avg. Borr. (% of $\overline{Y}$)
0.66	0.0694	0.1336	1.4211	0.8027	−11.64%
0.50	0.0699	0.1349	1.4211	0.8029	−11.63%
0.40	0.0698	0.1352	1.4189	0.8014	−11.67%

exclusion against filers, as well as the nonpecuniary costs, cause overall welfare to fall.

Interest rate spreads are relatively stable, but the deposit rate does fall from 2.57 percent in the benchmark to 2.35 percent and 2.31 percent as θ falls from 0.66 to 0.50 to 0.40, respectively (see Panel B of Table 3). The fall in deposit rates is the consequence of households needing to save more in the face of greater income loss from unemployment than before. As all households attempt to save more, the interest rate on savings falls. Conversely, as the cost of funds for banks falls, the increased bankruptcy rate does not result in an increase in the level of the interest rate on loans, relative to the benchmark. In terms of consumption smoothing, however, the presence of bankruptcy helps in the face of reduced replacement ratios. In Panel A of Table 4, the c.v. of consumption rises from 0.1347 to 0.1363 to 0.1374, with reductions in θ, when bankruptcy is not allowed. When bankruptcy is allowed (see Panel B of Table 4), the c.v. of consumption rises by less, from 0.1336 to 0.1349 to 0.1352. We therefore have the following:

Result 2 *Reducing the UI replacement ratio lowers welfare slightly and increases bankruptcy rates. However, the* ***fall*** *in welfare is nearly independent of whether or not bankruptcy is allowed. Additionally, reducing the UI replacement ratio worsens consumption smoothing less when bankruptcy is allowed.*

By making repayment optional, bankruptcy has the potential to reduce the need to actively accumulate and decumulate savings in the face of income shocks. Furthermore, in an economy where bankruptcy is allowed, the interest rate on loans might be prohibitively high, while that on savings very low, thereby retarding the ability of households to smooth consumption by borrowing and saving frequently. Indeed, for both reasons, bankruptcy appears to significantly lower asset trade. In particular, whenever bankruptcy is allowed, the volume and volatility of asset trade fall sharply, as seen in Panels A and B of Table 4. For example, compare the case when bankruptcy is allowed under the benchmark replacement ratio (Panel B) to the case where bankruptcy is eliminated under benchmark replacement ratios (Panel A). The coefficient of variation of assets jumps from 1.42 to 1.68 and the Gini Coefficient for assets similarly rises from 0.80 to 0.95. The average volume of borrowing, denoted "Avg. Borr.," also jumps from a roughly 11.6 percent debt-income ratio (approximately \$4,000 per household annually), which is close to the 8.5 percent level found in the data (CBO [2000]), to roughly 17 percent of median annual income (or \$7,000 per household).[14] Note, however, that in all cases, the response of asset trading to reductions in the replacement ratio is very modest. Therefore, we have the following:

Result 3 *Bankruptcy lowers asset trade and makes the distribution of wealth more equal. However, changes in the UI replacement ratio do not greatly alter asset trade.*

As seen above, when bankruptcy is prohibited, the premium on borrowing falls. This fall is in turn associated with a great deal more borrowing. For equilibrium to obtain in the credit market, however, it must also be the case that households save more in good times. In turn, one might expect the interest rate (recall that there is only one interest rate in the absence of bankruptcy) to rise. Indeed, when bankruptcy is eliminated, the rate of interest on bank deposits rises sharply from 2.57 percent under benchmark UI replacement ratios to 4.39 percent when bankruptcy is eliminated.

Given that both unemployment insurance and bankruptcy protection provide some insurance, it is useful to ask the following: If households had to choose either one, but not both, which would households prefer? Table 5 shows the results for four polar cases. Not surprisingly, it is unemployment insurance that is quantitatively much more important than bankruptcy. Welfare is lowest when bankruptcy is allowed and UI is driven down to $Y_{\min}$ by setting $\theta = 0.40$. The latter generates a utility level of -37.65 units. When bankruptcy is allowed but $\theta = 0.66$ (the benchmark case), utility rises to -37.57 units. When bankruptcy is not allowed and $\theta = 0.40$, welfare climbs further to -37.52 units. Last, allowing UI alone, with $\theta = 0.66$, produces the highest welfare, -37.44 units. In dollar terms, the quarterly welfare consequences range from $-$\$36.60 when bankruptcy is allowed and $\theta = 0.40$, to \$66.88 when bankruptcy is not allowed and $\theta = 0.66$, to +\$26.14 when bankruptcy is not allowed and $\theta = 0.40$. For exposition, let $Welf(Bk = \{Yes, No\}, \theta)$ denote the welfare under a regime where bankruptcy is either allowed (whereby

[14] Specifically, this measures, conditional on borrowing, the mean level of unsecured debt held by households.

$Bk = Yes$), or not ($Bk = No$), and a UI replacement ratio, θ. We can express the following rank ordering for welfare:

Result 4 $Welf(No, \theta = 0.66) > Welf(No, \theta = 0.40) > Welf(Yes, \theta = 0.66)[Benchmark] > Welf(Yes, \theta = 0.40)$. *Therefore, if society must choose either UI or bankruptcy, it should choose UI. Furthermore, even if it could choose both UI and bankruptcy, a society should choose UI alone.*

Also, as mentioned above, not allowing bankruptcy even when UI is very strict ($\theta = 0.40$) improves welfare relative to allowing bankruptcy when UI is generous ($\theta = 0.66$). This is the sense in which bankruptcy is quite damaging. The intuition for this is that better UI coverage mutes the consequences of exclusion from the credit market and makes bankruptcy more attractive. This raises a more general issue.

Remark 1 *Any program that smooths a household's income lowers the need for access to credit markets. Therefore, bankruptcy becomes most attractive precisely when it is least necessary.*

Thus far, I have held the subsistence level of income, $Y_{\min}$, fixed while altering the replacement ratio and bankruptcy law. The subsistence level of income is meant to represent the combined effects of all social insurance programs beyond unemployment insurance. One abstraction is that the period is thirteen weeks long, when eligibility for unemployment benefits is typically at least twenty-six weeks. In the benchmark setting, $Y_{\min}$ could be thought of as representing these extra benefits in the remaining thirteen weeks (if one qualifies), after which other income support programs might take over. I now briefly note the effects of cutting UI off after one period, followed by only minimal public assistance. To this end, I set public assistance to cover just 10 percent of median household income, whereby $Y_{\min} = 0.10$. In this case, the household that is no longer qualified for UI receives the equivalent of only \$333 monthly in public assistance.[15] I will not discuss these results in detail, but will note the following findings: First, both savings and borrowing interest rates fall, as precautionary savings rise. Second, welfare rises as bankruptcy is allowed. Third, welfare rises by increasing amounts as the replacement ratio falls, consistent with an increased insurance role. Last, the reductions in welfare emerging from reductions in the UI replacement ratio are smaller when bankruptcy is allowed than when it is not. Therefore, because the results for $Y_{\min} = 0.10$ reverse those where $Y_{\min} = 0.40$, we are led to the following conclusion:

Result 5 *Bankruptcy's role in providing insurance is clearly dependent on the existing social safety net. For example, when $Y_{\min}$ is lowered to 0.10, allowing bankruptcy improves welfare relative under all UI replacement ratios.*

[15] Assuming a \$40,000 median annual income.

Table 5 Bankruptcy and UI: Four Polar Cases

Bkrptcy., θ	r^l	r^d	Bkrptcy. Rate	c.v.-Cons.	Gini-Cons.	Welfare Change ($)	Utility
Bench [Yes, $\theta = 0.66$]	13.00%	2.57%	0.90%	0.1336	0.0694	—	−37.57
Yes, $\theta = 0.40$	12.55%	2.31%	0.99%	0.1352	0.0698	−$36.60	−37.65
No, $\theta = 0.66$	4.39%	4.39%	—	0.1347	0.0663	+$66.88	−37.44
No, $\theta = 0.40$	4.06%	4.06%	—	0.1374	0.0671	+$26.14	−37.52

Corollary 1 *The debate over bankruptcy protection (in the presence of existing insurance programs) should be centered on the quantitative aspects of income uncertainty.*

This result is also consistent with the recent work of Livshits et al. (2002), who find, in a life-cycle setting, that the presence of large uninsured medical shocks allows bankruptcy to play a role in improving welfare.

3. FINAL REMARKS

I have developed a stylized model of employment, unemployment, and bankruptcy in order to better understand how the consumption "insurance" provided by bankruptcy interacts with that provided by explicit unemployment insurance programs.

Five results are worth noting. First, in the benchmark economy, introducing bankruptcy under even low UI replacement ratios lowers welfare. Second, reducing the UI replacement ratio lowers welfare slightly and increases bankruptcy rates. Although the fall in welfare is nearly independent of whether bankruptcy is allowed or not, reducing the UI replacement ratio worsens consumption smoothing less when bankruptcy is allowed. Third, bankruptcy lowers asset trade and makes the distribution of wealth more equal. However, asset trading behavior is not affected greatly by changes in the UI replacement ratio. Fourth, UI is more important than bankruptcy: If society must choose either UI or bankruptcy, it should choose UI.

Last, bankruptcy's role in providing insurance is clearly dependent on the existing social safety net. In summary, unemployment insurance appears to materially affect the desirability of bankruptcy protection. Were other social assistance to be scaled sharply back, the results suggest that bankruptcy could serve a useful insurance role in the United States. However, as currently practiced, income risk, broadly defined, does not appear high enough to justify bankruptcy in the presence of unemployment insurance. Indeed, when unemployment insurance is set to current levels, bankruptcy actually appears to harm the efficacy of the UI system.

A potentially important abstraction in the model is the absence of moral hazard that could limit the extent of socially desirable insurance protection. Specifically, unemployed households in the model do not alter their job search efforts in the face of insurance payments but rather face an exogenous probability (ξ) of return to employment. Hansen and Imrohoroglu (1992) find that when households are allowed to reject job offers while unemployed, but are subject to random (or imperfect) auditing by the government, the welfare maximizing level of insurance is much lower than otherwise. Furthermore, effort expended by workers *while employed* may fall with the promise of generous unemployment insurance. Also, the availability of bankruptcy will help reduce the incentive effects of strict unemployment insurance and may further increase moral hazard. The experience rating of employers lowers the willingness of firms to fire lazy workers, leading again to the possibility of reduced effort. Moral hazard in an economy where output is explicitly produced using labor leads in turn to lower output, quite unlike the pure endowment setting employed here. The model also places fixed limits on credit availability that do vary with bankruptcy law. It is possible that a strict bankruptcy code would improve access to credit.

Nevertheless, there are reasons to suspect that the simple environment developed here does provide a useful first pass at the interactions between the UI system and the personal bankruptcy system. In particular, the unemployment insurance in the model is strictly capped at one period, and the re-entry probability of 0.10 by no means provides comfortable income prospects for those who fail to find work. With respect to the robustness of using fixed credit limits, note that the elimination of bankruptcy is treated here synonymously with the prohibition of default. To the extent that informal default would become more prevalent were bankruptcy outlawed, the expansion of credit availability might be limited. With that said, in ongoing work (Athreya [2002a]), I augment the model developed here to include moral hazard in job search effort, as well as capital accumulation and the production of output where labor effort matters. This article is therefore a first step in the analysis of how the interactions between bankruptcy and an existing social insurance program determine the desirability of changes to each one in isolation.

APPENDIX: DEFINING EQUILIBRIUM

A stochastic stationary equilibrium is defined as follows: Let $X = A \times \widetilde{Y} \times CS$ denote the state space for households, where $CS = \{S, BC\}$. Let χ_B be the Borel σ-algebra on X. The household's asset decision rule is denoted $a(x)$.

The decision rule and the uncertainty of income together imply a stochastic process for consumption and asset holdings, with an associated transition function $Q(x, Z), \forall Z \in \chi_B$ on the measurable space (X, χ_B). This transition function implies a stationary probability measure $\mu(Z)$ for all $Z \in \chi_B$. This is a measure on subsets of X that describes the joint distribution of households on asset holdings, current income, and credit market status. For a measure to be stationary, it must satisfy the following fixed-point condition:

$$\mu(Z) = \int_X Q(x, Z) d\mu.$$

This implies fixed interest rates on loans and deposits and a constant fraction of bankrupt households. Not every stationary probability measure, however, qualifies as part of an equilibrium. Since the private bond market must clear, aggregate holdings of private bonds must be zero. Additionally, all public debt must be held in equilibrium. Therefore, market clearing requires that the aggregate supply of bonds equals the stock of public debt, D.

Next, as the banking sector is competitive, profits also must be zero. The zero-profit constraint is motivated as follows: First, let $X_{neg} = \{x \in X | a < 0\}$ denote the subset of the state space X such that households hold negative asset balances. In the stationary state, there is a time-invariant mass of households, whose total borrowing is given by $\int_{X_{neg}} a(x) d\mu$. The total revenue for the intermediary will therefore be $(1 + r^l)(|\int_{X_{neg}} a(x) d\mu|)$. Analogously, the total cost of funds for the intermediary is determined by total borrowing times the gross deposit interest rate, $|(1 + r^d) \int_{X_{neg}} a(x) d\mu|$. The losses from default are on both interest and principal from those who borrow. Define $\pi(x)$ to be the probability that a household in state x will default. Total principal losses are therefore $|\int_X a(x)\pi(x) d\mu|$. The zero profit condition on intermediaries is then: $(1 + r^l)\ ((|\int_{X_{neg}} a(x) d\mu|) - (|\int_{X_{neg}} a(x)\pi(x) d\mu|)) - |(1 + r^d) \int_{X_{neg}} a(x) d\mu| = 0$. (Note that the aggregate default rate is then given by $\Pi \equiv \int_X \pi(x) d\mu$.) Lastly, the unemployment insurance system must collect revenues equal to outlays, i.e., $\eta_u = (1 - \rho)\mu_e \theta \overline{Y}$. The following five equations will therefore define equilibrium.

Definition 2 *A stationary equilibrium of the model is a four-tuple,* $(a(x), \pi(x), \mu(Z), (r^l, r^d))$, *that satisfies four conditions.*

1. *The decision rule,* $a(x)$, *is optimal, given* r^d *and* r^l.
2. $\mu(Z)$ *is stationary:* $\mu(Z) = \int_X Q(x, Z) d\mu$ *for all* $Z \in \chi_B$.
3. *Asset market clearing:* $\int_X a(x) d\mu = D$.
4. *Zero profits:* $(1 + r^l)\ ((|\int_{X_{neg}} a(x) d\mu|) - (|\int_{X_{neg}} a(x)\pi(x) d\mu|)) - |(1 + r^d) \int_{X_{neg}} a(x) d\mu| = 0$.
5. *Unemployment insurance fund breaks even:* $\eta_u = (1 - \rho)\mu_e \theta \overline{Y}$.

I use simple discrete state approximations to the value functions, conditional on income and credit market status, and then use Monte Carlo integration with antithetic variates to compute all integrals. I then bisect on both r^l and r^d until I simultaneously clear markets and satisfy the zero-profit condition.

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